IMPORTANT ROCK CHARACTERISTICS

Directions: The rock in which the repository is built must be appropriate for a repository. Some basic properties of rocks important for consideration in determining the appropriateness of the tuff at Yucca Mountain are listed below. On the blank before the property, write the letter of the definition that best decribes the property. Then explain why each characteristic is important to consider when planning the repository.

D 1. Plasticity *(Plastic deformation may help to seal fractures in the rock, but when pushed too far rocks will fracture rather than flow plastically.)*

H 2. Solubility *(Highly soluble rock may lead to greater permeability and porosity as minerals dissolve and are carried away.)*

B 3. Sorptive capacity *(Rock surfaces with high sorptive capacities may be able to chemically or physically remove radionuclides from any possible waste streams.)*

F 4. Compressive strength *(Rocks with high compressive strength will resist fracture and maintain low levels of permeability and porosity.)*

C 5. Thermal stability against chemical decomposition *(The greater the thermal stability, the greater the ability of many rocks and minerals to maintain chemical sorptive capacity.)*

G 6. Permeability *(The degree of interconnectedness of pores is important in limiting possible waste stream flow.)*

E 7. Porosity *(A large amount of connected pore space may contribute to the ability of radionuclides to migrate away from the repository.)*

A 8. Heat conductivity *(Since the waste package will be thermally hot, the ability of surrounding rocks to dissipate heat is important to avoid extreme temperatures that may fracture rock or damage the waste package.)*

DEFINITIONS

A - the ability to transmit heat
B - the extent to which a rock can adsorb or absorb from solution
C - the degree of resistance to heat causing a chemical change
D - the ability of a solid to flow, especially under influence of pressure and/or temperature
E - the percentage of the total volume of pores or spaces in a rock or soil to its total volume
F - the extent to which a material can be squeezed without breaking or fracturing
G - the capacity of a medium (rock, sediment, or soil) to transmit fluid (gas, liquid such as ground water); depends on the size and shape of the pores in the medium and how they are interconnected
H - susceptibility to being dissolved; tendency to dissolve

ROCK CHARACTERISTICS IMPORTANT IN REPOSITORY SITING

Directions: Use what you have learned in your reading lesson to answer the following questions.

True or False: If the answer is false, correct it to make it true.

false 1. Waste solutions will almost always begin to dissolve the rock through which they pass.
(Waste solutions may dissolve the rock through which they pass, depending upon the composition of the solution or the rock.)

true 2. All rocks are porous and permeable.

false 3. Non-welded tuff is stronger and denser than welded tuff.
(Welded tuff is stronger and denser than non-welded tuff.)

Matching:

c 4. A measure of how well any material will transmit heat.

a 5. A measure of the deforming effect of heat on any material.

b 6. A measure of the transforming effect of heat on any material.

a. *plasticity* b. *thermal stability* c. *thermal conductivity* d. *porosity*

Completion:

7. Waste can flow from one location to another in what two forms?

(gas or air) and *(liquid or ground water)*

8. Why would the compressive strength of rocks be a consideration in selecting a site for a nuclear waste repository?

(Answers will vary but should relate to the integrity of the mine: would not want the repository or mine to collapse; would not want anything to break through from the surface.)

9. Describe an example of a chemical sorptive process.

(An example of a chemical sorptive process would be ion exchange like that used in water-softening devices.)

10. Describe an example of a physical sorptive process.

    (Immobilization of water molecules in small pores by frictional forces between molecule and pore wall is an example of a physical sorption.)

11. Describe the process by which welded tuff is formed.

    (A cloud of small particles of molten rock erupts from a volcano. Rock particulates from the cloud cool and solidify. The particles fall to the ground and accumulate as a layer.)

12. Compare porosity and permeability.

    (Porosity is a measure of the ability of anything to hold a fluid. Permeability is a measure of the ease of flow of a fluid through a porous solid.)